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AN ANCIENT MOONFISH

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ONE of the strangest of all fishes that swim the seas is the great moonfish or Opah, called in California "*Mariposa*" (*Lampris luna* Gmelin). It is a broad flat fish almost as deep as long, with flattened sides, small toothless mouth, and short tail with strong muscles at its base. It lives in the open seas, reaching a weight of four hundred pounds, and is likely to appear on any coast, though always very rarely. It has low fins, no scales and its body colors are a rich brocade of maroon and red with white spots of varying sizes and over all a bright sheen of silver. Its flesh is rich, tender and toothsome, but no person is likely to taste it more than once, as the fish seldom appears twice in the same place. Young specimens I have never seen and I would not know where to look for them, for the fish probably casts its spawn in the open sea.

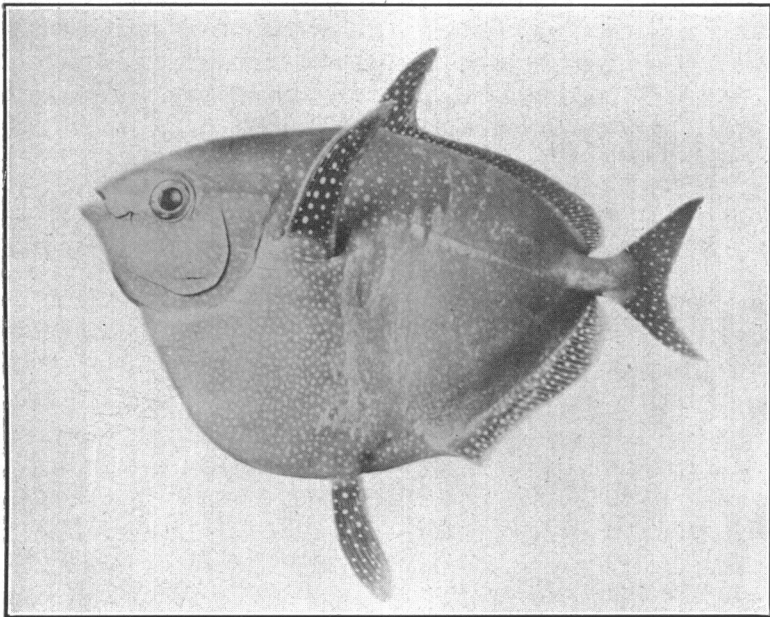


FIG. 1. Photograph of a cast by S. F. Denton of a *Lampris luna* weighing 100 lbs. taken at Honolulu. The triangular space between gill opening and ventral is all occupied by the shoulder girdle.

The one living species of *Lampris* is not related to any other existing fish, constituting an order (*Selenichthyes*) by itself. It bears some resemblance to the pomfret (*Brama*) and to other derivations of the mackerel tribe, but its likeness is superficial only, and not borne out by the skeleton. The bony framework

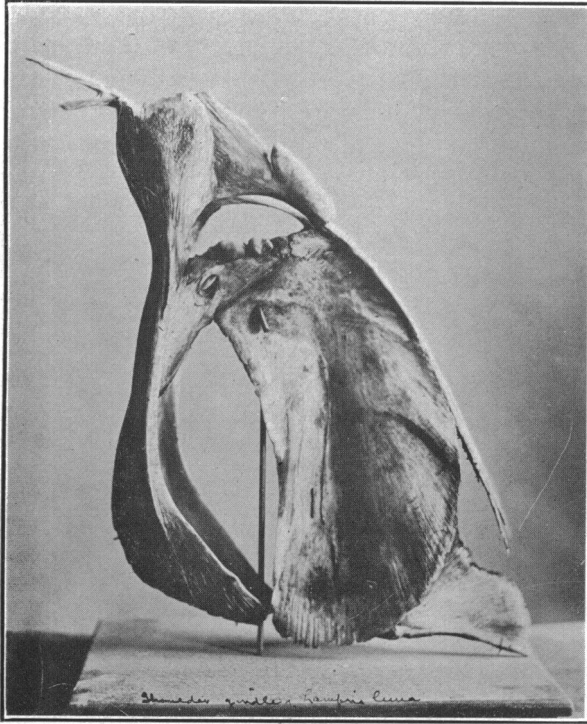


FIG. 2. Photograph of the shoulder girdle of a large example from Monterey, prepared by E. C. Starks.

shows many unique features, the most important being the extraordinary development of the shoulder girdle. The clavicle and hypocoracoid are excessively enlarged and separated by an interspace, the latter flattened and more or less fan-shaped downward, both bones being proportionately many times as large as in any other fish. The hypercoracoid, pierced by a large foramen, is also much enlarged and so placed that the actinosts or "wrist-bones" of the pectoral fin form a horizontal series, and the long oar-like fin can move only up and down. Behind the coracoids—the postclavicle extends as a long spear-shaped separate bone. Beside these features, the moonfish has very large and expanded pelvic bones, which support strong

ventral fins each with 15 long rays, a marked contrast to the one spine and five soft rays of most spiny-rayed fishes.

The extraordinary diatom beds at Lompoc, Santa Barbara County California, in which four square miles of a Miocene bay are covered to the depth of 1,400 feet with masses of pure diatoms, I have discussed elsewhere.¹ In these beds at one horizon occur untold millions of skeletons of a small herring (*Xyngreus*) while in the upper strata are many remains of predatory fish which have entered what was once a bottle-shaped bay in order to feed on herring. This is evident from the fact that one of the skeletons of a large mackerel has two herring skeletons in what was once its stomach.

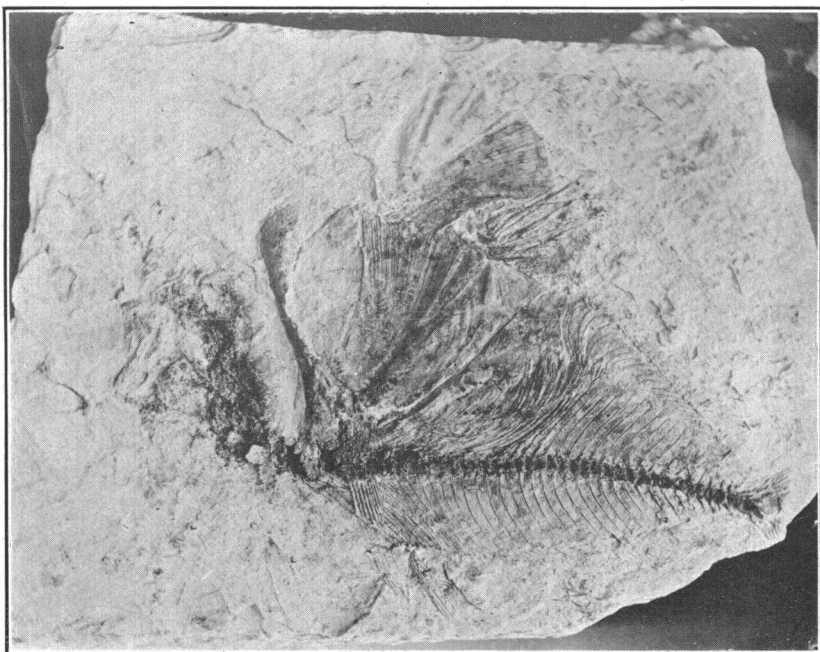


FIG. 3. Skeleton of *Lampris zatlma* taken in the Miocene Diatom beds at Lompoc, by E. J. Porteous. In this specimen a portion of the hypocoracoid of the left side appears detached under the other.

Among the relics of these predatory invaders is a very complete skeleton of a second species of moonfish, three feet long by about two broad. From *Lampris luna* it differs in the somewhat fewer vertebræ and fin rays, and in having the hypocoracoid broader, and less rapidly rounded off at its bottom.

¹ See "A Miocene Catastrophe," *Natural History*, XXI., No. 1, pp. 18-22, 1920.

Two smaller specimens, apparently of the same species, but lacking the head and shoulder girdle, had been previously found at Lompoc. To one of these Jordan and Gilbert (J. Z.) had given (in 1919) the name of *Diatomæca zatima*. With the complete skeleton, however, I see no characters by which *Diatomæca* can be separated as a genus from *Lampris*. The extinct moonfish of these Miocene Diatom beds may therefore stand as *Lampris zatima*. The specimen is one of great interest as showing the antiquity of one of the most singular of all living bony fishes, and incidentally with other associated forms, the relative age of the present fish fauna of California.